about:blank? Online Interventions for Postpartum Depression

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Keywords

Depression, postpartum · Internet · Cognitive behavior therapy · Review, systematic

Abstract

Background: Despite the existence of effective interventions for postpartum depression, few women use them. Online interventions have the potential to overcome many barriers to treatment seeking. This systematic review describes the current state of research regarding online interventions for postpartum depression with special attention to the German-speaking area. **Methods:** We conducted a systematic Internet search to assess interventions found online. A systematic literature search identified publications on online interventions for women with postpartum depression, which targeted the reduction of symptoms of depression, the mother-child interaction, and/or other child-related variables. We extracted information on conceptual design, efficacy, and adherence to the interventions. **Results:** References to interventions on the Internet comprised mostly general advice about treatment options and some specific entries on face-to-face interventions. Online interventions were scarce. The systematic literature review yielded 14 articles on 6 mostly CBT-based interventions. While the programs were effective in reducing symptoms of depression, they had little impact on mother-child interaction. Other child-related variables were not included in the studies. There was no intervention from German-speaking countries. **Discussion and Conclusions:** The potential of online inter-

ventions for postpartum depression is hardly used. Guided CBT-based self-help interventions seem to be a promising treatment for postpartum depression, yet more research is needed.

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about:blank? Online-Interventionen bei postpartaler Depression

Schlüsselwörter

Depression, postpartale · Internet · Kognitive Verhaltenstherapie · Übersichtsarbeit, systematische

Zusammenfassung

Hintergrund: Obwohl es wirksame Interventionen zur Behandlung einer postpartalen Depression gibt, werden diese häufig nicht genutzt. Online-Interventionen bieten vielfältige Möglichkeiten, Therapiehinderungsgründe zu überwinden. Die vorliegende systematische Übersichtsarbeit bildet den aktuellen Forschungsstand zu Online-Interventionen bei postpartaler Depression mit besonderem Augenmerk auf den deutschsprachigen Raum ab. **Methode:** Mit einer systematischen Internetrecherche wurde untersucht, auf welche Interventionen Hilfesuchende im Internet stoßen. Durch eine systematische Literaturrecherche wurden Publikationen zu Online-Interventionen für Frauen mit postpartaler Depression er-

mittelt, die die Reduktion der Depressionssymptomatik, die Mutter-Kind-Interaktion und/oder andere das Kind betreffende Variablen zum Ziel hatten. Informationen zu Konzeption, Effektivität und Adhärenz der Interventionen wurden extrahiert. **Ergebnisse:** Bei der Internetrecherche fanden sich Hinweise auf Interventionen, die zumeist allgemein gehalten oder auf konkrete Face-to-Face-Angebote bezogen waren. Online-Interventionen waren kaum vertreten. Die systematische Literaturrecherche ergab 14 Artikel zu 6 überwiegend kognitiv-verhaltenstherapeutisch fundierten Programmen. Diese waren effektiv in der Reduktion der Depressionssymptomatik, zeigten für die Mutter-Kind-Interaktion aber kaum Effekte. Andere das Kind betreffende Variablen wurden nicht untersucht. Interventionen aus dem deutschsprachigen Raum fanden sich nicht. **Diskussion und Schlussfolgerungen:** Das Potential, Frauen mit postpartaler Depression mit Online-Interventionen zu erreichen, wird bisher kaum genutzt. Onlinebasierte geleitete Selbsthilfeprogramme mit kognitiv-verhaltenstherapeutischer Fundierung scheinen ein vielversprechender Weg zu sein, der jedoch weiter beforscht werden muss.

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Theoretical Background

Depression has a negative effect at all times in life. In the case of postpartum depression, those affected are simultaneously confronted with other, often new challenges, such as the responsibility for a newborn child, its care, adaptation to the new role constellation, or physical complaints as a result of the birth. In order to counteract the serious negative effects of postpartum depression, a therapy that is immediately available and effective would be vital. However, affected women face not only a lack of outpatient therapy places [Bundespsychotherapeutenkammer, 2018] but also specific obstacles such as limited mobility, time and scheduling problems, and shame and fear of stigmatization [Dennis and Chung-Lee, 2006]. Internet-based interventions offer a promising perspective to counteract these barriers: They are almost totally independent of time and venue and ensure a simultaneous care of many affected persons.

According to O'Hara and McCabe [2013], a postpartum depression is any major or subsyndromal depression occurring in the first year after giving birth. However, there is not a uniform classification of postpartum depression; in particular, the severity and definition of the postpartum period vary. Meanwhile, the term *peripartal* is frequently used, which includes pregnancy as well as the postpartum period [Falkai and Wittchen, 2015].

The unclear classification of postpartum depression has an impact on prevalence estimates. Often cited re-

views or meta-analyses report prevalence rates of 13% (time period: 2 weeks postpartum) [O'Hara and Swain, 1996] or 19.2%, respectively, for minor and major depression and 7.1% for major depression (time period: the first 3 months postpartum) [Gavin et al., 2005].

The symptoms of a postpartum depression do not differ from those of a depressive episode but may be related to the birth or the baby [Robertson et al., 2003]. A widely used screening instrument for postpartum depression is the Postnatal Depression Scale (EPDS) [Cox et al., 1987], a 10-item self-report questionnaire.

In addition to the negative consequences for the mother, postpartum depression can also have negative effects on the mother's caring behavior towards the child and on the mother-child interaction [O'Hara and McCabe, 2013]. The children were found to have behavioral problems and poorer language and IQ development from childhood to adolescence, although the extent to which the child was exposed to maternal depression seems to be relevant [O'Hara and McCabe, 2013]. Therefore, it is urgent that affected women are provided with low-threshold access to effective interventions that have a positive impact on mother-child interaction and child development as well.

In face-to-face therapy, positive effects on depression symptoms were observed for various psychotherapeutic interventions such as interpersonal psychotherapy, cognitive behavioral therapy, and psychodynamic psychotherapy, but also for various forms of counselling [O'Hara and McCabe, 2013]. O'Hara and McCabe [2013] cite two meta-analyses of psychological interventions for postpartum depression that yielded medium effect sizes (Cohens $d = 0.51$ or Hedges $g = 0.57$), although they point to methodological limitations of the studies included in the meta-analyses. Variables concerning the child and mother-child interaction were examined much less frequently. O'Hara and McCabe [2013] found two interventions that had a positive influence on the mother's perception of parental stress; one intervention had a positive effect on the perceived relationship with the child and another intervention led to an increase in the mother's positive emotional involvement and verbalization. The studies did not find any significant positive effects of the interventions on child-related variables [O'Hara and McCabe, 2013].

Two problems should be pointed out: in relevant studies, high dropout rates are repeatedly reported [O'Hara and McCabe, 2013] and in practice, many affected persons apparently do not seek treatment [von Ballestrem et al., 2005]. Although high dropout rates are also a problem in Internet-based interventions for depression [Königbauer et al., 2017], such treatments offer a special potential to reach women with postpartum depression for whom face-to-face therapies are difficult to implement. Dennis and Chung-Lee [2006] give a comprehensive overview of barriers that prevent women with postpar-

tum depression from seeking help. Online interventions have the potential to solve many of these obstacles. Due to their flexibility, online interventions could overcome time and scheduling problems as well as infrastructural and mobility-related hurdles. Furthermore, they offer a high degree of anonymity, which could help to overcome shame and fear of stigmatization and could also help to reduce the fear of intervention by child protection authorities. In principal, language barriers, too, could be dismantled with online interventions provided that an intervention program is available in several languages. The extent to which the advantages apply to individual online interventions depends largely on the concrete design.

According to Klein and Berger [2013], there are three different approaches to psychological online interventions: (1) psychotherapy via the Internet in which the Internet is primarily used as a medium of communication and psychotherapy is carried out at a distance (e.g., by e-mail or chat); (2) unguided self-help programs in which the focus is on providing information and users implement psychological interventions step by step, and (3) guided self-help programs which are supplemented by brief therapeutic contacts, e.g., by e-mail. Here, the Internet is used as an information and communication medium.

Psychological online interventions have already proven effective in treating depression: in a meta-analysis comprising 10 studies on Internet- and mobile phone-based interventions in depression, Königbauer et al. [2017] found a large pooled effect size (Hedges $g = -0.90$) compared to waiting list control groups. Richards and Richardson [2012], in a meta-analysis of 19 studies on primarily cognitive-behavioral computer-based psychological interventions in depression, found a pooled mean effect size of $d = 0.56$, whereby 2 of the 19 studies were not online studies. They also reported a difference in the pooled effect sizes between therapist-assisted interventions ($d = 0.78$) and those without such support ($d = 0.36$). Königbauer et al. [2017], however, did not find such a difference. Note that their analysis was limited to three studies. The dropout rates reported by Richards and Richardson [2012] differed significantly between therapist-assisted interventions (28%) and interventions without support (74%). In a systematic review of computer- and Web-based interventions for perinatal mental health, Ashford et al. [2016] reported for the majority of interventions an effect of the interventions on the reduction of depressive symptoms with mean ($d = 0.55$) to large ($d = 1.03$) effect sizes. In their systematic review of Web-based interventions for the prevention and treatment of perinatal affective disorders, Lee et al. [2016] also found evidence of a positive influence of the interventions on the reduction of depression symptoms but found only four studies corresponding to their inclusion criteria, of which they rated only one as of good quality.

The Internet is an important medium for information and communication for women in child-bearing age. In Germany, 99% of all women aged between 16 and 44 years use the Internet, and 67% (ages 16 to 24) as well as 86% (ages 25 to 44) seek information on health issues there [Statistisches Bundesamt, 2017]. Osma et al. [2016], in a study on pregnant women and women in the postpartum stage, report that 92.1% of the respondents had looked for health-related information on the Internet and that 57.4% had downloaded health-related apps. Thus, the Internet offers a high potential to reach women with postpartum depression. Whether and how this potential is used will be examined in this study.

First, we conducted a systematic Internet search to determine which interventions people seeking help encounter when they look for treatment options for postpartum depression on the Internet. In particular, we examined the extent to which online interventions are represented. Second, through a systematic literature search, we mapped the current state of research regarding online interventions for women with postpartum depression and examined whether there are corresponding programs also for the German-speaking area. We gathered findings on effectiveness of the interventions in relation to depressive symptoms, mother-child interaction, and/or other child-related variables. As this is a rather young field of research, we additionally collected variables on adherence and on the conception of online interventions.

Method

Systematic Internet Search

With the help of a keyword research tool (www.ubersuggest.io), the 10 German-language combinations of the terms “postpartum depression” and “intervention” that are entered into Internet search engines in Germany with the largest average monthly search volume were first determined. Therefore, the terms “postpartale Depression” and “Wochenbettdepression” (both German for postpartum depression) were entered into the search field of the keyword research tool one after another and search queries related to these terms were determined via the “related” tab. These were screened manually for combinations of synonyms of the above mentioned terms and synonyms of the term “intervention.” The extracted combinations were ranked according to the average monthly search volume and the 10 combinations with the highest average monthly search volume were selected. On May 30 and May 31, 2018, these were successively entered into a large Internet search engine (www.google.de) and the websites listed on the first two result pages were searched for interventions. Psychotherapeutic interventions, counselling services, self-help groups, forums, and chat rooms as well as clinics were classified into suitable categories, provided that they were tangible online or offline interventions (e.g., by telephone or face-to-face) or indications thereof. Referrals to doctors or midwives in charge of treatment, or indications of the basic possibility of psychotherapeutic treatment, were classified in the category “general information.” Pharmacological interventions were excluded, as they are usually not directly avail-

Table 1. Systematic Internet search: number of hits by search syntax and categories

Search syntax** (average monthly search volume)	Types of interventions					
	psychotherapeutic (on-/offline)	counselling (on-/offline)	self-help group (on-/offline)	chat/ forum	clinic	general information
Postpartum depression (°) help (110)	-/2	2/9	-/9	-	2	16
Postpartum depression (°) treat (110)	-/-	-/6	-/4	-	3	18
Postpartum depression (°) treatment (110)	-/-	-/5	-/6	-	3	19
Postpartum depression (°) therapy (50)	-/2	2/10	-/4	-	4	19
Postpartum depression therapy (40)	-/-	1/3	-/5	-	10	15
Help with postpartum depression (°) (40)	-/-	1/10	-/8	-	2	17
What to do with postpartum depression (°) (40)	-/-	1/4	-/5	3	3	18
Postpartum depression treatment (30)	-/-	1/5	-/7	-	10	17
Postnatal depression treatment (30)	-/1	2/4	-/6	-	7	17
Help with postnatal depression (20)	-/-	2/6	-/7	1	14	16

The category “general information” contains information on intervention options (psychotherapy, self-help group, etc.) and contact persons (doctors, midwives etc.) without a specific address. For the category “general information,” only one reference per website was counted as a hit, whereas for the other categories, each reference was counted. In some searches, the same website appeared on both page 1 and page 2 of the Internet search engine and may have been treated as a separate website. All hits in the category “chat/forum” were forums. -, no hits. ** Search terms were translated into English. In German, there are two expressions for postpartum depression: *Wochenbettdepression* and *Postpartale Depression*. Expressions marked with (°) correspond to the originally used German term *Wochenbettdepression*.

able but only through medical treatment. For the specific interventions, each individual reference on a website was counted as a hit, for the category “general information,” only one reference for the entire website was counted as a hit. Only the website linked directly in the search engine was searched. One of the authors (B.W.) carried out all steps of the systematic Internet search.

Systematic Literature Search

The methodological approach of the systematic literature search was based on the recommendations of the PRISMA statement [Liberati et al., 2009]. The following inclusion criteria were defined in advance: (1) an online-based intervention, (2) aimed at women with postpartum depression (period of time: birth to 12 months postpartum). The limitation to the postpartum period is based on the assumption that women in the postpartum period have different demands on an intervention than pregnant women, e.g., with regard to the temporal flexibility of the intervention but also with regard to content aspects, such as direct interaction with the child, breastfeeding problems, sleep problems, etc. (3) The intervention used level of depression and/or the mother-child interaction and/or other child-related variables as endpoints. (4) In order to gain a comprehensive overview of the current state of research on online interventions in postpartum depression and to be able to understand conception processes, publications on interventions in all stages were included, ranging from the conception of a concrete online intervention to study protocols and primary analyses to secondary analyses of individual studies. Reviews and meta-analyses were excluded as they did not provide sufficient information on the individual interventions for the purposes of this paper. Also excluded were articles that were not written in German or English. On April 30, 2018, the titles, abstracts, and keywords of entries from the databases PsycINFO, PubMed, Web of Science, PubPsych, and the Cochrane Library were searched for a combination of the terms “postpartum depression,” “intervention,” and “online.” Different synonyms ((postpartum depression OR post-

natal depression OR peripartum depression OR perinatal depression OR (depression AND birth) AND (Intervention OR treatment OR therap* OR self-help OR service OR program* OR counseling OR counselling OR psychotherap*) AND (Internet* OR computer* OR online* OR web*)) were used. A time limit was not applied. After removing duplicates, the entries identified in this way were first checked for inclusion and exclusion criteria on the basis of title, abstract, and keywords and then, if necessary, on a full-text basis. We extracted the following information from the included articles: authors, year of publication, type of article, name of program, target group, theoretical basis of the intervention, use and type of support, structure, and duration as well as usability on different devices. Following the example of Richards and Richardson [2012], the support used in the interventions was divided into the following categories: no support, administrative support, and therapeutic support. In addition, other parameters (e.g., sample size and dropout rate) were collected from the studies in addition to information on efficacy and adherence. All steps of the systematic literature search were carried out by one of the authors (B.W.).

Results

Systematic Internet Search

Table 1 shows an overview of the results of the systematic Internet search. For all search terms entered, the first two result pages of the search engine contained websites with interventions or references to interventions. Most of the references fell into the category “General references.” These websites often had a psychoeducational character and, together with an overview of postpartum depression, contained information on basic treatment options. Those

Fig. 1. Identification and selection process of the systematic literature search. PPD, postpartum depression.

seeking help would, as a second step, have to look for specific treatment options such as psychotherapists, clinics, or self-help groups in their vicinity or to contact doctors and midwives.

Among the references to concrete offline interventions, we found several references to counselling services (three to 10 references) and self-help groups (four to nine references) in all search rounds. Similarly, several references to clinics offering treatment for postpartum depression were found in all search rounds (two to 10 references). In this case, the widely differing numbers were due to individual websites listing up to five clinics. Comparatively few websites referred to concrete psychotherapeutic offers: in three out of 10 search rounds, we found one or two references to corresponding offers.

There were comparatively few online offers in the searches. In eight out of 10 search rounds, we found one to two offers or references for online counselling. In ad-

dition, in two out of 10 search rounds, forums or references to them were among the hits in which those concerned sought advice (one to three hits). It was striking that in the search round for “What to do in case of postpartum depression,” three hits were such forums. Apparently, the search syntax has an influence on the categorical composition of the hits. There were no hits on psychotherapeutic online interventions.

Systematic Literature Search

A total of 744 hits were obtained. Following a multi-stage selection process (see Fig. 1), we included 14 articles on six online intervention programs for postpartum depression in the analysis.

The online interventions come from Australia, the USA, the UK, Norway, and Canada. None of the programs comes from German-speaking countries or is available in German.

Table 2. Overview of controlled studies on online interventions in postpartum depression

Authors [year], name of the programs, country	Sample		Recruitment	Design (control group)	Post-measurement time, effects
	PPD operationaliza- tion; particularities	n (IG/CG), dropout rate			
Baumel et al. [2018], 7 Cups of Tea, USA	PPD diagnosis by psychiatrist; treatment at Zucker Hillside Hospital	47 (20/17), 6.38%	Recruitment of outpatients via hospital staff	controlled feasibility study (subsequently created control group, treatment-as- usual)	4 weeks, EPDS: $d = 0.58$
Milgrom et al. [2016], MumMoodBooster, Australia	<12 months post- partum, major/ minor depression (DSM-IV)	43 (21/22), 4.65%	Australia-wide: online advertisements, social media; Melbourne: health centers (clinic staff)	randomized controlled trial (treatment-as-usual)	12 weeks, BDI-II: $d = 0.83^*$ PSOC: $d = 0.53$
O'Mahen et al. [2013], Netmums, Great Britain	≤12 months post- partum, EPDS >12; member of Netmums	910 (462/448), 62.31%	Advertisements on Netmums website, via Netmums newsletter	randomized controlled trial (treatment-as-usual)	15 weeks, EPDS: $d = 0.55^{**,\dagger}$ EPDS <12: 63% (IG) vs. 43.8% CG*** (completer) or 24.9% (IG) vs. 15.9% (CG)*** (if non-respondents were counted as depressed)
O'Mahen et al. [2014], Netmums, Great Britain	≤12 months post- partum, major depression (ICD-10)	83 (41/42), 14.46% (posttest) and 28.92% (6-month follow-up)	Advertisements on Netmums website, Netmums PPD chat room, Netmums newsletter, e-mails to posters from the PPD chat room, Netmums social media channels	randomized controlled trial (treatment-as-usual)	17 weeks, EPDS: $d = -0.96^{**}$ (imputation) PBQ: $d = 0.25$ (imputation); follow-up (6 months): EPDS: $d = -0.68$ (imputation)
Pugh et al. [2016], Maternal Depression Online, Canada	≤12 months post- partum, EPDS ≥10; place of residence in Saskatchewan	50 (25/25), 14% (post- test)	Information for doctors*, perinatal nurses*, and the public about posters, info cards, online advertise- ments, media interviews	randomized controlled trial (waiting list control group)	10 weeks EPDS: $d = 1.08^\dagger$, significant group × time interaction, no effect strengths reported PSI-SF: $\beta = -0.25$ PD: $\beta = -0.41^{**}$

PPD, postpartum depression; IG, intervention group; CG, control group; EPDS, Edinburgh Postnatal Depression Scale; DSM-IV, Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; BDI-II, Beck Depression Inventory-II; PSOC, Parenting Sense of Competence Scale; ICD-10, International Statistical Classification of Diseases and Related Health Problems, 10th Revision; PBQ, Postnatal Bonding Questionnaire; PSI-SF, Parenting Stress Index-Short Form; PD, Parental Distress. † Effect strength calculated by the authors. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Conception

MumMoodBooster was developed in cooperation with US-American and Australian research teams. This intervention uses a manualized, cognitive-behavioral therapeutic group intervention for women with postpartum depression that was adapted for the online context. First, the authors conducted a formative study [Danaher et al., 2012], then a feasibility study [Danaher et al., 2013], followed by a randomized controlled study [Milgrom et al., 2016]. The intervention was designed for computer use and, in its most recent version, offered therapeutic support through weekly telephone calls. The program consisted of six sessions over a period of 6 weeks.

Netmums comes from the UK. For this intervention, a manualized Behavioral Activation Program was adapted for online use as well as for the target group. After a first randomized controlled trial with a large sample but high dropout rate [O'Mahen et al., 2013], the program was re-

vised and a second, smaller randomized controlled trial was conducted [O'Mahen et al., 2014]. A secondary analysis was also included [O'Mahen et al., 2017]. The program was designed for computer use and the latest version provided therapeutic support via weekly telephone calls. The final version of the program included 12 sessions over a period of 12 weeks.

We included a feasibility study [Haga et al., 2013] and a conceptual description [Drozd et al., 2015] on the Norwegian intervention program *Mamma Mia*. This is intended to be an intervention and prevention program, the latest version of which was to be offered to all women with or without depressive symptoms from the 18th to 24th week of pregnancy. The intervention followed an eclectic approach with elements from metacognitive therapy, mainly used for depression treatment, positive psychology, couple therapy, and programs to promote parental sensitivity and mother-child relationship. The program

could be used on computers, smartphones, and tablets. The use of support was not planned. The most recent version of the program included 44 sessions over a period of 11.5 months.

Maternal Depression Online is from Canada. We included a case study [Pugh et al., 2014], a qualitative study [Pugh et al., 2015], and a randomized controlled trial [Pugh et al., 2016]. For the intervention, a therapeutic cognitive-behavioral online depression intervention program was modified for the target group with the same group postpartum depression intervention program as that used in *MumMoodBooster*. The program was usable on computers. *Maternal Depression Online* offered a therapeutic support by e-mail. The program consisted of seven sessions over a period of 7 weeks.

For the 7 *Cups of Tea* program from the USA, we included a formative [Baumel and Schueller, 2016] and a feasibility study [Baumel et al., 2018]. The intervention was intended as a supplement for patients with postpartum depression who were already undergoing treatment. It provided support from trained chat partners who had previously been affected themselves. In the feasibility study, the program also included various self-help components such as psychoeducation, acceptance and commitment therapy exercises, as well as audio-based mindfulness exercises. The program was usable on computers, smartphones, and tablets and there was administrative support. The program was available on demand and there was no time limit.

For the Australian program *MUMentum Postnatal*, we found a study protocol [Loughnan et al., 2018]. It was aimed at postpartum women with clinically elevated depression and/or anxiety symptoms. For this intervention, an Internet-based cognitive-behavioral therapeutic intervention for depression and anxiety was adapted for the target group. The six-session program was divided into a course for pregnancy (*MUMentum Pregnancy*) and the postpartum period (*MUMentum Postnatal*) respectively. *MUMentum Postnatal* was intended for computer use and there was administrative support. The program consisted of three sessions and lasted from 3 to 6 weeks.

Effectiveness and Adherence

Four out of six intervention programs were the subject of empirical studies to assess their effectiveness. Table 2 gives an overview of the controlled studies. On this basis, the following picture emerged with regard to the effectiveness in reducing the symptoms of depression: for *MumMoodBooster*, a significantly greater reduction of depression symptoms ($d = 0.83$, large effect) was observed in the intervention group compared to treatment-as-usual [Milgrom et al., 2016]. A similar picture was found for *Netmums*: in the first randomized controlled study, a significant mean effect ($d = 0.55$) of the intervention was found

in comparison to treatment-as-usual, but in this study, there was a high dropout rate of 62.31% [O'Mahen et al., 2013]. Also, in a second randomized controlled study on *Netmums*, a significantly greater reduction of depression symptoms was observed at the post-test time for the intervention group compared to treatment-as-usual ($d = -0.96$ [multiple imputation], large effect); however, after 6 months, there were no more significant group differences in this regard [O'Mahen et al., 2014]. For *Maternal Depression Online*, a large non-significant effect ($d = 1.08$) was observed with regard to depressive symptoms. An interaction effect between group and time was also observed: in the intervention group, the depression symptoms decreased significantly faster than in the waiting list control group (no effect size reported) [Pugh et al., 2016]. For 7 *Cups of Tea*, a mean effect of the intervention was observed for the reduction of depressive symptoms compared to treatment-as-usual ($d = 0.58$, $p = 0.05$) [Baumel et al., 2018].

With regard to mother-child interaction, the controlled studies examined parental self-efficacy expectations [Milgrom et al., 2016], parental perception of the relationship to the child [O'Mahen et al., 2014], and parental stress [Pugh et al., 2016]. Only for *Maternal Depression Online* was there a statistically significant effect (no effect size reported) on parental stress of the intervention compared to the waiting list control group, whereas the intervention had no statistically significant effect on parental stress overall [Pugh et al., 2016]. Other child-related variables were not investigated.

With regard to adherence, it was noticeable that the proportion of women attending all sessions varied significantly between interventions. While it was 86% for *MumMoodBooster* [Milgrom et al., 2016], only 2% of the participants in the second *Netmums* study completed all 12 sessions [O'Mahen et al., 2014]. In *Maternal Depression Online*, 60% of the participants completed all seven sessions; the largest dropout occurred between the fifth and seventh sessions [Pugh et al., 2016].

Discussion

Overall, the results of the systematic Internet search suggest that those seeking help with an Internet search for interventions in postpartum depression primarily find general information on treatment options as well as some concrete interventions. These were primarily "offline" interventions, carried out by telephone or face-to-face, for example. The range of online interventions, on the other hand, is comparatively small and limited to a few online advisory services and forums. The fact that there was no evidence of psychotherapeutic online interventions was probably due primarily to aspects of professional and liability law. Although online interventions offer many ad-

vantages for the target group of women with postpartum depression, according to the current state of research there are hardly any offers for German-speaking areas.

However, the systematic Internet search also had limitations. For example, those affected might choose other search terms because they may not know what the syndrome they suffer from is called. They might also enter more specific search terms such as “postpartum depression clinic” or “postpartum depression forum.” Furthermore, the search volume of the individual combinations of terms appears to be relatively small. Terms such as “postpartale Depression” (English: postpartum depression, yielding on average 2,400 search queries per month), “Wochenbettdepression” (English: postpartum depression, on average 6,600 search queries per month), or “baby blues” (on average 8,100 search queries per month) are searched for much more frequently. Apparently, fewer people search for interventions in a targeted manner and/or the terms used do not reflect the most common search terms. An empirical approach, in which (potentially) affected persons are asked for search terms and strategies, could provide more precise insights here. If one compares the number of hits in the respective categories, it is noticeable that the search term combinations lead to partly clearly different numbers of concrete clues. For example, the search syntax “treating postpartum depression” had a comparatively small number of concrete clues, although with an average of 110 search queries per month, it is one of the most frequently entered term combinations. It would therefore be advisable for operators of such websites to optimize the search engines. The short-lived nature of many websites and the varying order in which they are listed in search engines contribute to the fact that the systematic Internet search carried out has the character of a snapshot. However, the considerable number of references to self-help groups and counselling centers is in so far misleading as the same few self-help organizations or counselling centers were referred to repeatedly. We should also mention that the quality of the information on the websites fluctuated greatly and was partly influenced by religious and pseudoscientific concepts. Therefore, it seems all the more reasonable to create a high-quality, scientifically founded online intervention service.

In the systematic literature search, we identified six online-based intervention programs for postpartum depression. Most of the included interventions can best be classified as guided self-help interventions (*MumMood-Booster*, *Netmums*, *Maternal Depression Online*), but also unguided self-help interventions (*Mamma Mia*, *MUMentum Postnatal*) were represented. Concepts such as *7 Cups of Tea* illustrate further innovative possibilities to counter postpartum depression.

Four out of six interventions were designed based on cognitive behavioral therapy and adapted to the target

group and/or online use. Since the evaluated interventions were successful in reducing depressive symptoms compared to treatment-as-usual or a waiting list control group, this seems to be a useful way to develop online interventions in postpartum depression. The effect sizes were in the medium to large range. They were thus not only comparable with the effect sizes reported in a systematic review of computer- or Web-based interventions on perinatal mental health [Ashford et al., 2016] but also with the effect sizes determined in meta-analyses of face-to-face interventions in postpartum depression [O’Hara and McCabe, 2013] and Internet- and mobile phone-based interventions in depression [Königbauer et al., 2017; Richards and Richardson, 2012]. However, no effect was discernible for the parental expectation of self-efficacy, the parental perception of the relationship to the child, or the overall parental stress. Other variables affecting the child were not examined. This could be partly because diagnostic possibilities are limited: behavioral observations via the Internet are difficult and, above all, mothers’ external reports on their children are likely to be subject to bias.

With regard to adherence, it became apparent that interventions with fewer sessions appear to be more likely to be completed. This result in addition to higher effect sizes for interventions with up to seven sessions [Richards and Richardson, 2012] provides a further argument for interventions with fewer sessions.

However, the results of the systematic literature search must be interpreted with caution, as many studies have methodological limitations. These include, for example, the high dropout rate in the first *Netmums* study (62.31%) [O’Mahen et al., 2013], where the observation of Richards and Richardson [2012] confirms that interventions without support [O’Mahen et al., 2013] have significantly higher dropout rates than interventions with support [O’Mahen et al., 2014]. The authors also suspect that easy access to the study contributed, among other things, to a low sense of personal commitment [O’Mahen et al., 2013]. The relatively small sample sizes [Baumel et al., 2018; Milgrom et al., 2016; Pugh et al., 2016] and specific sample pools (e.g., women from a certain online community [O’Mahen et al., 2013; O’Mahen et al., 2014] or women who have already been treated in a clinic [Baumel et al., 2018]) also affect the generalizability of the results. The design of treatment-as-usual conditions differed significantly between the studies and ranged from treatment in a particular hospital [Baumel et al., 2018] to no further measure [O’Mahen et al., 2013; O’Mahen et al., 2014]. In addition, the inconsistent classification of a postpartum depression is also reflected in the different operationalization between the studies.

To our knowledge, this systematic review is the first to deal exclusively with online interventions in postpartum depression. As this is a young field of research, several interventions have been included, not all of which have yet

been evaluated and not all of which have been designed as stand-alone programs. Other reviews from the field instead limited the types of studies or interventions to be included but also included those on other mental disorders in the perinatal period [Ashford et al., 2016; Lee et al., 2016]. The inclusion of publications on interventions at all stages proved only to be useful to a limited extent because, for example, information contained in secondary analyses and case studies is too specific to be adequately taken into account in this review. A further limitation of the publications to be included would therefore be useful for future systematic reviews. Adding depressive symptoms to the search syntax could have a positive effect on the number of hits of future systematic literature searches.

Conclusions

Based on the findings on the conception and effectiveness of the online interventions in postpartum depression, the overall impression is that guided self-help interventions with a (cognitive-)behavioral therapy orientation seem to be a promising way of treating postpartum depression. The programs can be completed comfortably and temporally flexible from the computer and offer a certain degree of anonymity. Therapeutic support assists and motivates the participants to continue the program. Such interventions can be developed from existing interventions, taking into account the target group and online format. Further advantages are the quality due to a certain degree of standardization and the comparatively lower costs associated with self-help approaches [Klein and Berger, 2013].

However, we should interpret this conclusion as a preliminary first impression in view of the current research situation. Future studies should include not only depressive symptoms but also long-term effects, mother-child interaction, and child variables as endpoints, as these have not been investigated in previous online interventions. Further research on unguided self-help programs or psychotherapy via the Internet, with other theoretical backgrounds, could enrich the spectrum of online interventions.

Intervention apps for postpartum depression also have a high potential, which has hardly been used so far: Osma

et al. [2016] found that the most widespread device women used during the perinatal period was the mobile phone and that a large proportion of the users had already downloaded health-related apps. Terhorst et al. [2018] investigated German-language apps for use in depression and found above all qualitative deficiencies and the lack of efficacy studies.

Furthermore, there is a lack of detailed knowledge on the economic viability of such online activities compared to face-to-face interventions.

An important practical aspect is how online interventions can reach those affected. Klein and Berger [2013] consider a promising model according to which family doctors prescribe Internet-based psychological interventions after diagnostic clarification. After successful development of appropriate interventions, this could also be extended to gynecologists in the case of postpartum depression. Similarly, following the example of Zagorscak et al. [2018], cooperation with health insurance companies is conceivable that would draw the attention of affected insured persons to the possibility of participating in the intervention. Findings from the systematic Internet search suggest that only a small number of those affected are specifically looking for interventions. However, it would be conceivable to link websites that primarily inform about postpartum depression to online intervention programs or to advertise the intervention directly on the Internet, e.g., via social media, in addition to general references to intervention possibilities and references to concrete face-to-face offers. Search engine optimization and advertising of corresponding intervention websites could also increase their reach. Findings on this topic can be found for instance in Barrera et al. [2014].

According to the insights of this systematic review, online interventions offer a promising perspective for the treatment of postpartum depression. Now, further research is needed to gain valid insights into effective interventions and possibilities of their conception – especially for the German-speaking area, for which there seem to be no corresponding online interventions so far.

Disclosure Statement

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